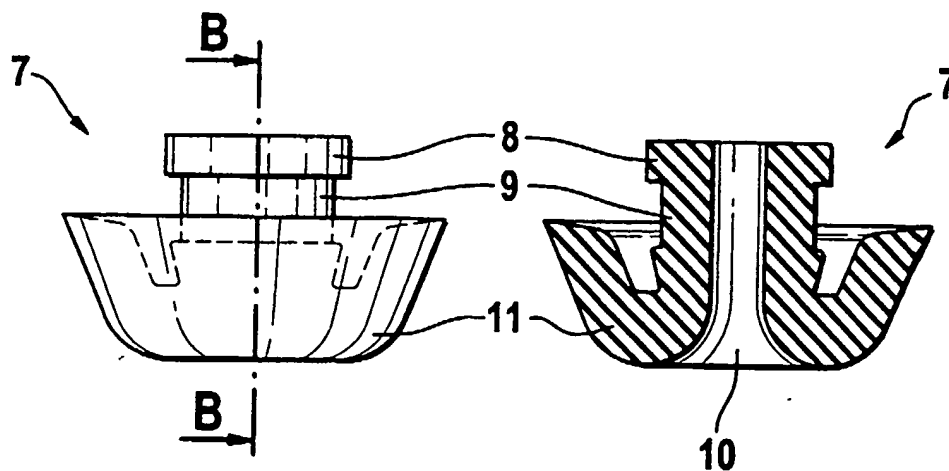




**Fig. 1b**



**Fig. 2b**

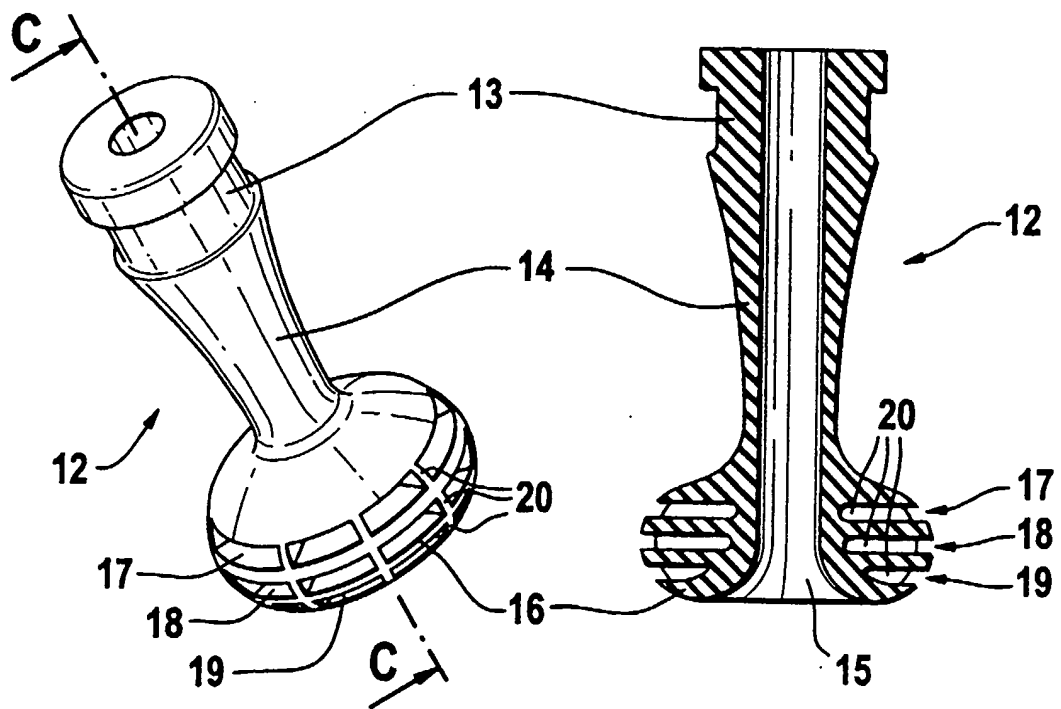


Fig. 3a

Fig. 3b

Anti-kinking sleeve for a mains cable

Prior art

The present invention relates to an anti-kinking sleeve for a mains cable of a hand-guided electrical appliance, particularly a hand-held machine tool, wherein the said anti-kinking sleeve has, at one end, a first portion which can be inserted in a casing of the appliance and adjoining which is a second portion leading out of the said casing of the appliance.

The mains cable introduced into the casing of the appliance is intended to be as flexible as possible, particularly in the case of hand-guided electrical appliances, for example hand-held machine tools, so that it hinders the handling of the appliances as little as possible. In the course of working operations using the hand-guided electrical appliance, the mains cable is subjected to very high bending stress at precisely the point at which it passes out of the casing of the appliance. There is therefore a danger of the wires in the mains cable breaking as a result of very high bending stresses.

In order to keep the bending stresses on a main cable as low as possible, it is known practice, as emerges from DE 198 47 456 A1, DE 199 24 551 A1 or DE 43 44 635 A1 for example, for an anti-kinking sleeve to be provided which is inserted in the casing of the appliance and through which the mains cable passes into or out of the said casing. An anti-kinking sleeve of this kind offers a mains cable satisfactory protection against kinking directly at the point of entry into the casing of the appliance. But the known anti-kinking sleeves nevertheless do not prevent the mains cable from undergoing high bending

stresses at the point at which it passes out of the anti-kinking sleeve outside the electrical appliance.

The underlying object of the invention is therefore to indicate an anti-kinking sleeve of the type initially mentioned, which offers a mains cable belonging to a hand-guided electrical appliance the best possible protection again high bending stresses.

#### Advantages of the invention

The object mentioned is achieved with the aid of the features in claim 1, through the fact that there is formed on, at that end of the anti-kinking sleeve which forms an exit aperture for a mains cable, a bead whose outer contour is so dimensioned that the said bead limits deflection of a mains cable passing out of the sleeve to a minimally admissible bending radius.

The bead therefore prevents the possibility of a mains cable that passes out of the anti-kinking sleeve being bent, at this point, to such an extent that its bending radius falls below a minimally admissible one. As a result of this, the mains cable is prevented, with the aid of simple means, from breaking as a result of excessively high bending stresses.

Advantageous further developments of the invention emerge from the subclaims.

The bead may have a variety of shapes. It may, for example, have the shape of a drop which becomes thicker towards the rim of the exit aperture, or else it may be of conical or mushroom-shaped construction. What is decisive is the geometry of that surface of the bead which comes into contact with the mains

cable. That is to say, the shape of the said bead determines the minimally possible bending radius of the mains cable in the region of the exit aperture of the anti-kinking sleeve.

In order to keep the bead as elastic as possible, clearances may be provided in it. These clearances may, for example, be one or more clearances which are radially circumferential with respect to the longitudinal axis of the sleeve. Webs which connect the walls of the radially circumferential clearances and which prevent the bead from being excessively deformed by the mains cable are advantageously present in the said clearances.

#### Drawings

The invention will be explained in greater detail below with the aid of a number of exemplified embodiments which are represented in the drawings, in which:

Figure 1a shows an anti-kinking sleeve with a drop-shaped bead in an outer view, and figure 1b shows the said sleeve represented in the longitudinal section A-A;

Figure 2a shows an outer view of, and figure 2b a representation in the longitudinal section B-B through, an anti-kinking sleeve with a mushroom-shaped bead; and

Figure 3a shows an outer perspective view, and figure 3b a representation in the longitudinal section C-C, of an anti-kinking sleeve with a spherical bead and clearances let into the latter.

## Description of exemplified embodiments

An anti-kinking sleeve 1 for a mains cable of a hand-guided electrical appliance, particularly a hand-held machine tool, is represented in figures 1a and 1b. In the latter, figure 1a shows the outer view of an anti-kinking sleeve 1, and figure 1b a longitudinal section A-A through the said sleeve. The anti-kinking sleeve 1 essentially consists of two portions: a first portion 2 which is constructed in such a way that it can be anchored in a casing of the appliance, and a second portion 3 which adjoins the first portion 2 and which passes out of the said casing. Located at the end of this second portion 3 is an exit aperture 4 for a mains cable 5 which extends through the anti-kinking sleeve 1 and into the casing of a hand-guided electrical appliance.

The anti-kinking sleeve 1 cannot prevent the mains cable 5 from being kinked round at the exit aperture 4. It is detrimental to the said mains cable 5 if it is kinked to such an extent that its bending radius falls below a minimally admissible bending radius  $R$ . In order to prevent this, a bead 6 which surrounds the exit aperture 4 is formed onto the end of the second portion 3 of the anti-kinking sleeve 1. The outer contour of this bead 6 is so dimensioned that the bending radius of a mains cable 5 which is bent round the said bead 6 does not fall below a minimally admissible bending radius  $R$ . The latter is about 1.5 times the diameter  $D$  of the mains cable 5. That longitudinal section A-A through the anti-kinking sleeve 1 which is represented in figure 1b makes it clear that the bead 6 substantially determines the bending radius  $R$  of the mains cable 5 in the region of the exit aperture 4.

The bead 6 represented in figures 1a and 1b has the shape of a drop which becomes thicker towards the rim of the exit aperture 4. Other shapes for the bead 6 are shown in figures 2a, 2b and 3a, 3b.

Figure 2a shows an outer view of, and figure 2b a longitudinal section B-B through, an anti-kinking sleeve 7 which likewise has a first portion 8 which is anchored in the casing of the appliance, and an adjoining second portion 9 which passes out of the said casing. Located at the end of this second portion 9, in the region of the exit aperture 10 for the cable, is a bead 11 which, in this exemplified embodiment, is of approximately mushroom-shaped construction.

Another anti-kinking sleeve 12 is represented in figures 3a, 3b, where figure 3a shows an outer perspective view of, and figure 3b a longitudinal section C-C through, the said sleeve. This anti-kinking sleeve 12 likewise has a first portion 13 which is anchored to the casing of the electrical appliance, and an adjoining second portion 14 which projects out of the said casing. In this case, a bead which is formed on at the end of this second portion 14, in the region of the exit aperture 15 for the cable, has the shape of a ball or a flattened ball.

In order to impart a degree of elasticity to the bead 16, the latter is provided with one or more clearances 17, 18 and 19, which are radially circumferential with respect to the longitudinal axis of the sleeve. Webs 20 which connect the walls of the clearances 17, 18, 19 to one another are expediently located in the said clearances. These webs 20 ensure a degree of stability of the bead 16, so that a mains cable which is bent round the latter cannot compress the said bead to such an extent that the bending radius of the cable falls below a minimally admissible bending radius R.

The other shapes for the bead which are represented in figures 1a, 1b and 2a, 2b may also be provided with clearances and webs.



In a departure from the exemplified embodiments previously described, any shape which is suitable for limiting the bending radius of the mains cable to a minimally admissible value may be chosen for the bead.

## Claims

1. Anti-kinking sleeve for a mains cable of a hand-guided electrical appliance, particularly a hand-held machine tool, wherein the said anti-kinking sleeve (1, 7, 12) has, at one end, a first portion (2, 8, 13) which can be inserted in a casing of the appliance and adjoining which is a second portion (3, 9, 14) leading out of the said casing of the appliance, characterised in that there is formed on, at that end of the second portion (3, 9, 14) which forms an exit aperture (4, 10, 15) for a mains cable (5), a bead (6, 11, 16) whose outer contour is so dimensioned that the said bead limits deflection of a mains cable (5) passing out of the sleeve (1, 7, 12) to a minimally admissible bending radius (R).
2. Anti-kinking sleeve according to claim 1, characterised in that the bead (6) has the shape of a drop which becomes thicker towards the rim of the exit aperture (4).
3. Anti-kinking sleeve according to claim 1, characterised in that the bead (16) is of spherical construction.
4. Anti-kinking sleeve according to claim 1, characterised in that the bead (11) is of mushroom-shaped construction.
5. Anti-kinking sleeve according to one of claims 1 to 4, characterised in that the bead (16) is provided with clearances (17, 18, 19) which increase its elasticity.

6. Anti-kinking sleeve according to claim 5, characterised in that the bead (16) has one or more clearances (17, 18, 19) which are radially circumferential with respect to the longitudinal axis of the sleeve.
7. Anti-kinking sleeve according to claim 6, characterised in that webs (20) which connect the walls of the clearance(s) (17, 18, 19) are present in the latter.
8. An anti-kinking sleeve for a mains cable substantially as herein described with reference to Figures 1a and 1b; Figures 2a and 2b; or Figures 3a and 3b of the accompanying drawings.

Amendments to the claims have been filed as follows

1. An anti-kinking sleeve for a mains cable of a hand-guided electrical appliance, the anti-kinking sleeve having, at one end, a first portion which can be inserted in a casing of an appliance and which is adjoined by a second portion which, in use, leads out of the said casing of the appliance, an end of which second portion forms an exit aperture for the main cable wherein a bead is formed on the sleeve at the exit aperture, the outer contour of which is dimensioned such that, at the exit aperture, the bead limits the maximum bending radius of the cable as it emerges from the sleeve to a value which is greater than a minimum permissible value.
2. An anti-kinking sleeve according to claim 1, wherein the bead has the shape of a drop which becomes thicker towards the rim of the exit aperture.
3. An anti-kinking sleeve according to claim 1, wherein the bead is spherically shaped.
4. An anti-kinking sleeve according to claim 1, wherein the bead is mushroom-shaped.
5. An anti-kinking sleeve according to any of the preceding claims, wherein the bead is provided with apertures which increase its elasticity.
6. An anti-kinking sleeve according to claim 5, wherein the bead has one or more apertures which extend both radially and circumferentially with respect to the longitudinal axis of the sleeve.

7. An anti-kinking sleeve according to claim 6, further including webs which connect the walls of the apertures so as to separate the apertures from each other.
8. An anti-kinking sleeve for a mains cable substantially as herein described with reference to Figures 1a and 1b; Figures 2a and 2b; or Figures 3a and 3b of the accompanying drawings.



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Application No: GB 0209902.6  
Claims searched: 1 to 8

Examiner: Matthew Parker  
Date of search: 16 July 2002

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): H2E: EDD

Int Cl (Ed.7): H01R: 13/56

Other: Online: EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0193196 A (BRUNNQUELL), see Figure 3	1
X	DE 4009674 A (GROTE), see bead 28 in Figure	1-3
X	DE 1123768 (BOSCH), see Figure	1
X	US 3573714 (GENERAL ELECTRIC), see Figure 5	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.